

Appl. No. 10/820,855
Amendment dated: August 8, 2006
Reply to OA of: April 11, 2006

Amendments to the Specification:

Please replace original paragraph [009] with the following amended paragraph.

[009] [009] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention provides an under bump metallization structure disposed between bonding pads and solder bumps which comprises tin-alloy layer. Therein, the under bump metallization structure at least comprises an adhesive layer disposed on the bonding pads, a first barrier layer formed on the adhesive layer, a wetting layer disposed on the first barrier layer, and a second barrier layer formed on the wetting layer. It should be noted that the second barrier layer can slow down the formation of the inter-metallic compound in the interface between the first barrier layer and the wetting layer due to the material of the second barrier layer mainly comprising tin and ~~copper~~ nickel wherein the quantity of nickel is larger than that of tin so as to prevent discontinuous blocks, i.e. Ni_3Sn_4 , from forming in the first barrier layer of the under bump metallization structure. In such a manner, it will prevent the solder bumps from peeling off from the under bump metallization structure.

Please replace original paragraph [0018] with the following amended paragraph.

[0018] As shown in FIG. 2, a semiconductor wafer 200 having a passivation layer 202 and a plurality of bonding pads 204. Therein, the passivation layer 202 covers the active surface 201 of the semiconductor wafer 200 and exposes the bonding pads 204; and the under bump metallization structure 206 comprising an adhesive layer 206a, a first barrier layer 206b, a wetting layer 206c and a second barrier layer 206d is formed on the bonding pads 204. When the bonding pads 204 are made of aluminum, preferably, the adhesive layer 206a, the first barrier layer 206b and the wetting layer 206c are an aluminum layer, a nickel-vanadium layer and a copper layer, respectively. In addition,

when the bonding pads 204 are made of copper, preferably, the adhesive layer 206a, the first barrier layer 206b and the wetting layer 206c are a titanium layer, a nickel-vanadium layer and a copper layer, respectively. However, no matter which material of the adhesive layer 206a, the first barrier layer 206b and the wetting layer 206c are made, generally speaking, the adhesive layer 206a, the first barrier layer 206b and the wetting layer 206c mainly comprise titanium, tungsten, titanium-tungsten alloy, chromium, aluminum, nickel, nickel-vanadium alloy, nickel-copper alloy, nickel-titanium, and chromium-copper alloy, and are formed by the process of sputter or electro-plating. mainly comprises titanium, tungsten, titanium-tungsten alloy, chromium or aluminum, the first barrier layer 206b mainly comprises nickel, nickel-vanadium alloy, nickel-copper alloy or nickel-titanium alloy, and the wetting layer 206c mainly comprises copper, chromium-copper or copper alloy. In addition, the adhesive layer 206a, the first barrier layer 206b and the wetting layer 206c are formed by the process of sputter or electro-plating.

Please replace original paragraph [0023] with the following amended paragraph.

[0023] Moreover, a second preferred embodiment is provided as shown in FIG. 3A. Therein, the under bump metallization structure 306 of this invention according to the second another embodiment may comprise two electrically conductive layers 306a and 306b. A first electrically conductive layer 306a at least comprises a titanium layer, an aluminum layer, a nickel-vanadium alloy layer or a copper layer, and the titanium layer is directly attached to a plurality of bonding pads 304. In addition, the material of the first electrically conductive layer 306a is selected from the group of aluminum, titanium, titanium-vanadium alloy, titanium-tungsten alloy, copper, nickel-copper alloy, nickel and nickel-vanadium alloy and a second electrically conductive layer 306b mainly comprises lead tin and nickel wherein the first electrically conductive layer 306a is directly formed on the bonding pads 304 and the second electrically conductive layer 306b is directly

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connected to the bumps 308. In addition, the thickness of the second electrically conductive layer is ranged from about 50 µm to about 80 µm.